tested, along with the initial and final temperatures and humidity. The actual mass loss for each film configuration was recorded and is shown in **FIG. 14**, which is a plot of the evaporation rate curves actually measured (evaporation rate in the form of weight loss over time).

TABLE 2

Film Width	Experimental Data for Varying Film Widths and a Controlled Environment Initial Humidity/Temp	Final Humidity/Temp	Evaporation Rate
No Film	41% and 24 Celsius	11% and 24 Celsius	0.10 g/min.
5 inches	41% and 24 Celsius	31% and 23 Celsius	0.23 g/min.
10 inches	62% and 24 Celsius	62% and 23 Celsius	0.36 g/min
15 inches	62% and 24 Celsius	62% and 22 Celsius	0.57 g/min

Example 10

[**0158**] In Experiment 10, the mass loss versus time was recorded for the fluid reservoir **230**, but the control box **225** was not used. In other words, the fluid reservoir **230** was tested in the open air environment of a lab. An initial liquid volume of 100 cc was introduced onto the fluid reservoir **230** as described in Example 9 above, and the evaporation rate was measured in the case of no film versus a 15 inch wide film. Temperature and humidity conditions were not recorded because the environment could not be controlled, but the tests of these two film conditions were evaluated on the same day to minimize macroscopic differences. **FIG. 15** illustrates the data collected regarding weight loss of liquid over time. An evaporation rate of 0.041 grams/min. was achieved in the no film condition, while an evaporation rate of 0.24 grams/min. was achieved using a 15 inch wide film bearing a structured surface.

[**0159**] These experiments thus confirm the remarkable improvement in the evaporation rate in the passive application of the fluid transport tape of the present invention. It is believed that evaporation has increased significantly because the surface area of the liquid exposed to the atmosphere is significantly increased on a structured surface having channels. The liquid evaporated from the microstructured film surface can, of course, be water (as in the above examples), but also can be other liquid materials depending upon the application. For example, the liquid could be ink or lubricants, or the liquid could be a fragrance or a fuel, or any combination of these types of liquids and characteristics.

[**0160**] **FIGS. 16***a* and **16***b* are illustrative of fluid flow effects across the face of a structured surface having a plurality of parallel channels, and specifically, of the increase in exposed fluid surface area achieved when a liquid is disposed on the structured surface of the present invention. A structured surface **250** having a plurality of channels **252** defined thereon has a liquid introduced thereon. In this exemplary illustration, the structured surface has a topography similar to **FIG. 2***a*, with alternating peaks **254** and valleys **256**. A liquid **260** introduced onto the structured surface **250**. The channels **252** are formed to spontaneously wick the liquid along each channel which receives liquid therein to increase the spacial distribution of the liquid in the x-direction. As the liquid **260** fills each channel **252**, its spacial distribution is also increased in the y-direction between the ridges of each channel **252**, and the meniscus height of the liquid **260** varies in the z-direction within each channel **252**, as seen in **FIG. 16***b*. Adjacent each ridge, the liquid's exposed surface **262** is higher. These effects in three dimensions serve to increase the exposed evaporatively active surface area of the liquid **260**, which, in turn, has the effect of enhancing the evaporation rate of the liquid **260** from the structured surface **250**. As seen by the test results, the evaporation rate is increased significantly by the amplification of the "wetting" of the liquid on the surface as a result of the liquid spontaneously wicking along the micro-structured channels, and by the further amplification of the meniscus of the liquid in each channel. The end result is a superior exposure of the surface area of the liquid to ambient atmospheric conditions. The evaporation rate can be further enhanced by introducing a moving air stream across the top of the liquid **260** and structured surface **250**.

[**0161**] Although not tested specifically above above, the inventive microstructured film surface also has beneficial effects for condensation applications (acquiring moisture from ambient as opposed to evaporation, where moisture is released to ambient). Both phenomena include a thermal energy component. For condensation to occur, the liquid landing zone on the microstructured film surface is at a temperature sufficiently lower than ambient to cause liquid to condense on the channels thereof. Once liquid has so condensed, the channels then serve to control liquid flow and divert the collected liquid to a suitable liquid removal zone for collection or further handling.

[**0162**] Group IV—Heat and Mass Transfer Enhancement Via Polymeric Microstructure Film Assemblies

[**0163**] As noted, the microstructured surfaces of the present invention can be used to enhance mass transfer during evaporation, as well as during condensation. These examples illustrate how the rate of evaporation is enhanced by using a microstructured surface film assembly, as opposed to non-structured material surfaces in the case of active fluid flow and also in the presence of active air flow over the surfaces. The fluid transport film can be presented to the liquid flow by any means, including on a support structure or any self-supported assembly. The resulting noted benefits include evaporative cooling effects, humidification, evaporation, as well as condensation removal from a gas stream.

[**0164**] In evaporative cooling, many methods have been employed to efficiently cool water through evaporation. The main industrial application for evaporative cooling is air-water contacts to cool large quantities of water, since many processes require a coolant at a temperature below the prevailing summer temperatures of available surface waters. Relatively small amounts of water are cooled by spray ponds, while larger amounts, up to 100,000 gallons/minute, are cooled in cooling towers. In a cooling tower, water cascades downwardly over a fill pack, which is a structure designed to impede the direct fall of water streams and to increase the surface area of the water exposed to ambient, often by breaking up the water into drops. Open passages are provided in the fill packs for the flow of air over the exposed surface area of the water. The air-flow may be cross-wise, upward and counter current to the water flow, or a combination of both. Fill packs formed of wood slats, plates and plastic honeycomb structures have been used to spread out the air/liquid interface to both improve the mass transfer rate